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Assessing the Profitability and Riskiness of Small Business Lenders in the Banking Industry[±]

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Two alternative research hypotheses concerning how small business lending affects bank profitability are tested. The *specialization hypothesis* argues for higher profitability than other banks due to increased focus on small business lending, whereas the *diversification hypothesis*

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asserts that small business lenders' profitability will be lower than other more diversified banks. Using the rate of return on assets as the profit measure, we find that small business exposure tends to have neutral or positive effects on bank profitability after taking into account bank risk. Using efficient frontier analyses that focus on the rate of return on equity, we find that small business lenders reap benefits from specialization, particularly in terms of reducing failure risk. We conclude that the evidence supports the specialization hypothesis.

Introduction

Small banks have traditionally been the largest supplier of credit to small business firms in the United States [see Kolar and Zardkoohi (1986, 1997) and Jayaratne and Wolken (1999)]. In recent years there has been concern that changes in the banking industry, including consolidation via mergers and acquisitions, internet banking, and deregulation allowing new combinations of banks and other financial service companies, will adversely affect small banks and associated small business lending [e.g., see Berger and Udell (1995), Peek and Rosengren (1998), Ely and Robinson (2001), Keeton (2001), and Whalen (2001)]. Recognizing these trends, in 1993 the four bank regulatory agencies made changes in supervisory policy to allow banks to place greater weight on "character" (as opposed to financial strength based on accounting statements) when making loans to small business firms [see Hooks and Opler (1994)].

Other research has found no reason to believe that small business credit would be affected by banking consolidation. Strahan and Weston (1997) reported evidence that consolidation among small banks leads to an increase in small business lending. Berger, Saunders, Scalise, and Udell (1997) reported similar findings in response to small bank mergers. Also, they found that small business lending may increase as bank size and complexity increases. These results contradict concerns that small business firms would not be able to access credit from large banking institutions; indeed, they surmised that small business credit supplies could increase in response to banking deregulation due to greater lending per dollar of assets in the banking industry. Other work by Jayaratne and Wolken (1999) reported that small business firms did not have greater access to credit in areas with many small banks. Moreover, Craig and João Cabral dos Santos (1998) did not find any clear relationship between small business lending and mergers and acquisitions in the banking industry, while Avery and Samolyk (2003) report evidence that community bank consolidations was associated with higher small business lending. In sum, studies are mixed on the question of whether small business firms will experience problems in obtaining adequate credit supplies from banks in the future.

In this paper we test two competing research hypotheses concerning how small business lending affects bank profitability per unit risk. The *specialization hypothesis* argues for higher profitability per unit risk as banks increasingly focus on small business lending. Alternatively, the *diversification hypothesis* asserts that profitability per unit risk will decrease as banks specialize in small business lending. If small business lending lowers profitability per the diversification hypothesis, it is reasonable to infer that bank consolidation resulting in larger, more diversified organizations and fewer numbers of small, specialized lenders [see Samolyk (1994)] will tend to diminish credit supplies to small business firms. On the other hand, evidence in favor of the specialization hypothesis would favor continued bank credit flows to small business firms. If small business lending has no effect on bank profitability, after controlling for risk of small business exposure, neither of these research hypotheses can be

accepted. In this case the implication to small business credit supplies would be mixed and no clear inferences can be drawn.

To assess the profitability and riskiness of small business lenders in the U.S. banking industry, we conduct a variety of empirical tests. Small business loans are defined to be less than \$250,000, as reported on the Call Reports of Income and Condition. Data is collected for individual banks from Call Reports for the period 1994-2001. To compare how small business lending differentially affects the financial performance of small and large banks, we group banks according to the following five different asset sizes: (1) less than \$100 million (very small), (2) \$100-\$300 million (small), (3) \$300-\$500 million (medium), (4) \$500 million - \$3 billion (large), and (5) greater than \$3 billion (very large). Empirical analyses are divided into two parts: (1) multivariate panel regression tests on the relationship between small business lending and banks' profitability as measured by the rate of return on assets (ROA), and (2) efficient frontier analyses that seek to examine how small business lending affects banks' rate of return on equity (ROE) and associated capital risk. Efficient frontiers are estimated for different types of specialized lenders to comparatively examine the risk and return characteristics of small business lenders with those of other specialized and diversified lenders.

Acharya, Hasan, and Saunders (2002) have observed that using banks for the study of diversification versus focus in asset allocation has advantages over nonfinancial corporations.¹ The main advantage is that banks can achieve focus and diversification relatively easily by changing loan exposures to industries. Additionally, the use of sector decomposition in the Call Report enables us to mitigate the problem of business unit identification in a firm. In this regard, studies of the relationship between diversification and value suffer from an endogeneity problem. That is, the diversification discount is caused by fundamental differences in the characteristics of firms that choose to diversify compared to those that choose to remain focused, rather than by diversification activity per se. Observation of the link between banks' returns and their asset composition over time is not exposed to this potential problem.

In brief, our empirical results indicate that after taking into account bank risk, small business lending generally has either neutral or positive ROA profit effects across different bank size groups. Also, small business lenders tend to have higher ROE profits per unit risk than more diversified lenders, due primarily to lower bank failure risk. The latter finding is interestingly because it contradicts the common belief that small business lending is risky relative to other types of lending. We conclude that the empirical evidence supports the specialization hypothesis, rather than the diversification hypothesis. If larger, more diversified organizations are the future of the banking industry, an important implication of our findings is that small business lending can play a positive role in terms of contributing to both bank profitability and failure risk reduction. As such, despite the on-going consolidation movement in the U.S. banking industry, banks likely will continue to play a central role in the provision of small business credit.

The next section overviews related empirical and theoretical literature. Section 2 describes our research methodology, including data and empirical models. Section 3 reports and discusses our empirical results. Section 4 gives the conclusion.

¹ In comparisons between diversification versus focus, studies using corporate financial data have documented focus as a value enhancing strategy [Denis, Denis and Sarin (1997), Lang and Stulz (1994), and Desai and Jain (1999)].

I. Related Literature

Small business loans are no doubt riskier than large business loans due to the greater likelihood that small firms will fail and subsequently default on their outstanding debt. Banks can mitigate this higher loan risk and earn fair profits by forming relationships with small business firms that enable them to closely monitor small firm borrowers and flexibly renegotiate contractual terms as needed to increase payment probabilities [see Berlin (1994)]. For these reasons banks will tend to specialize in a particular credit area to take advantage of management expertise. Alternatively, in order to reduce risk and thereby increase the profitability of small business lending, banks can diversify into other loan areas. In this way losses in one area of lending can be offset by gains in other areas, which tends to smooth profits and reduce risk. We next review selected empirical studies as well as theoretical studies that have attempted to examine how specializing in small business loans affects bank profitability.

A. Empirical Studies

Kimball (1997) compared small banks specializing in small business loans less than \$100,000 with a matched sample of small banks with low levels of small business lending. Most of these banks were located in small towns with populations less than 15,000. Small business lending banks had 40 percent or more of their assets in small business loans as of both June 1995 and June 1996. Semi-annual comparisons for the period December 1991 to June 1996 of the two bank groups' asset portfolios, liability structures, revenues and expenses, profit rates, standard deviation of profit rates, and probabilities of insolvency were reported. Relative to the control group of diversified small banks, specialized small business lenders tended to have higher pre-tax returns and higher volatility of these returns, higher levels of non-interest expense and provisions for loan losses, higher growth rates, lower capital to asset ratios, higher proportions of local deposits to total liabilities, and higher probabilities of insolvency in most periods.

Another study by Kolari, Berney, and Ou (1997) compared small business lending banks' profitability and risk to other banks based on June 1994 and June 1995 accounting data. All insured U.S. banks were stratified into deciles by the proportion of total assets devoted to small business loans less than \$250,000. Banks were further grouped according to asset size: less than \$100 million, \$100-\$300 million, \$300-\$500 million, \$500 billion-\$3 billion, and greater than \$3 billion. Univariate t-tests and multiple regression analyses showed that small business loans tended to increase bank profitability even after adjusting for risk. This result was robust to alternative profit measures, including the return on assets, net interest margin, net interest margin adjusted for loan and lease losses, and return on equity. Also, small business lenders tended to have higher risk in terms of credit risk, capital risk, liquidity risk, and funding risk compared to banks with little or no small business lending. The multivariate analyses revealed that, holding risk factors constant, small business lending either had a neutral or positive effect on small banks' profitability.

Previous work by Liang and Savage (1990) examined specialized nonbank lenders in bank holding companies, including commercial finance, mortgage banking, consumer finance, and leasing. These specialized lenders tended to have higher but more variable return on assets (ROA) and higher capital ratios than their more diversified bank counterparts. Also, using ROA and its variability, in addition to the equity to assets ratio, the authors estimated probabilities of insolvency and found that nonbank specialized lenders had higher failure chances than diversified bank lenders.

Related work by Eisenbeis and Kwast (1991) compared different types of specialized bank lenders in the area of real estate (i.e., low-risk residential mortgages, high-risk commercial real estate, and very risky real estate development) to a control group of diversified banks. Banks were required to have at least 40 percent of their assets in real estate loans in at least one year between 1978 and 1988 to be included in the sample. They found that specialized real estate lenders tended to have higher proportions of loans to assets, lower loan losses, high non-interest expenses, and a lower probability of insolvency than more diversified banks. These results favor the specialization hypothesis.

Another study by Laderman, Schmidt, and Zimmerman (1991) found that asset diversification of agricultural and nonagricultural lenders increased after statewide branching was permitted. They concluded that intrastate branching enabled banks to spread asset risks and thereby reduce the probability of failure in the banking industry. Consistent with Laderman et al., work by Hughes, Lang, Mester, and Moon (1996) indicated that an increase in geographic expansion by bank holding companies tended to lower failure risk (or increase aggregate bank safety).

Other studies on specialized lenders by Sinkey and Nash (1993, 1996) examined credit card banks from the mid-1980s to the mid-1990s. These banks held at least 75 percent of assets in credit card loans. When compared to a control group of diversified banks, the results closely paralleled those of Liang and Savage in support of the diversification hypothesis.

A recent study by Acharya, Hasan, and Saunders (2002) examined how specialization versus diversification affected the return and risk of 105 Italian banks in the period 1993-1999. The authors collected data on individual bank loan exposures to 23 different industries, six economic sectors (e.g., households, nonfinancial corporations, etc.), and three geographical regions (i.e., Italy, European Union, and other countries). Diversification was measured using a Hirschman-Herfindahl Index (HHI) computed as the sum of squared loans in a category divided by total loans for all categories. Returns are measured as the return on assets and return on equity, both computed from balance sheet data, as well as the annual stock return and market model residual return after taking into account beta risk with respect to the overall Italian stock market. Risk was measured as doubtful and nonperforming loans/total assets, the standard deviation of this ratio, and the standard deviation of annual stock returns. Control variables were asset size, equity capital ratio, number of branch offices/total assets, and number of employees/total assets. In general, consistent with the specialization hypothesis, they found that bank return was lower and risk was higher among banks with higher industrial loan diversification than other banks. This negative diversification effect was greater among high risk banks. Sectoral diversification was only negative among high risk banks. And, geographical diversification did increase returns among low risk banks. The authors concluded that there appears to be diseconomies of diversification for some banks. They also observed that their findings are consistent with DeLong (2001), who found that focusing mergers in terms of financial activities and geography tended to improve economic performance more than diversifying mergers.

Thus, the empirical evidence is mixed with regard to whether or not specialized lenders are riskier than more diversified lenders. While specialized lenders tend to be relatively more aggressive, it is not clear that their returns per unit risk are higher than diversified bank lenders. Given that diversification is a risk-reducing concept in modern portfolio theory, the low risk of some specialized lenders, such as real estate lenders in the Eisenbeis and Kwast study and small business lenders in some periods in the Kimball study, remains a puzzle. Also, the higher

profitability of small business lenders after controlling for risk factors in Kolari, Berney, and Ou is similarly inconsistent with portfolio theory.

B. Theoretical Studies

There are a number of motivations for banks to diversify (or not specialize). As observed by Klein and Saldenberg (1997), agency theory posits that managers can be expected to diversify to increase job their security, compensation, corporate control, or empire [e.g., see Amihud (1981) and Born, Eisenbeis, and Harris (1988)]. Also, an economic motivation is that product and market diversification should help to reduce firm-specific risk of failure [(e.g., see Saunders, Strock, and Travlos (1990)]. However, this motivation is mitigated to some degree by the separation principle that shareholders can reproduce bank level diversification by purchasing shares in different kinds of banks. In our opinion a countervailing force in the banking industry that diminishes the application of the separation principle is regulatory pressure to decrease failure risk. Capital requirements and supervisory procedures in banking are intended to lower failure risk. Finally, diversification may well yield economies of scope from offering a diverse array of financial services that lower operating costs and attract customers.

Theoretical work by Winton (1999) has sought to re-examine the debate concerning whether banks should diversify or specialize their lending activities. It is well known that diversification tends to reduce the chance of bank failure due to the reduction in variance of loan returns. However, according to Winton, there are several potential problems inherent in diversification. First, given the bank has limited human resources, diversification means that credit is provided in economic and geographic areas outside the bank's home base. This expanded lending responsibility can diminish the quality of loan monitoring. Since delegated monitoring is central to the existence of banks and makes them "special" relative to other lenders by virtue of their access to private (inside) information about borrowing firms [see Diamond, (1984), Fama (1980, 1985), Sharpe (1990), Rajan (1992), and others), weaker monitoring in diversified banks could be a critical factor affecting loan portfolio quality. Second, the bank likely will lend in areas that have a high downside risk to sector or geographic downturns. An implication of this problem is that diversification is most beneficial among banks with only moderate downside risk. Third, diversification may require increased size and added management to handle the broader risk exposure of the bank. On the other hand, specialization allows the bank to focus loans in its areas of expertise, thereby contributing to more effective loan monitoring.

Winton further argued that increasing competition in the banking industry should favor increased specialization. Contrary to the conventional wisdom that, given low profit margins, the best strategy is to reduce risk via diversification, his analyses suggest specialization is an attractive lending strategy due to "winner's curse" problems (i.e., banks entering markets with established banks face increased adverse selection difficulties as well as expert local monitoring of credit risk). In his words, "Loan monitoring improves returns not only by increasing best-case outcomes but by reducing the frequency and severity of worst-case outcomes ... diversification that lessens monitoring effectiveness may *increase* the frequency and severity of worst-case outcomes, increasing failure probability ..." (Winton, 1999, p. 3). He inferred that diversified banks likely require higher capital levels to absorb potentially higher credit losses than specialized banks. Also, he recommended that future empirical

studies should consider the impact of diversification and specialization on loan return distributions.

II. Research Methodology

We seek to examine how bank specialization in small business lending affects bank profits per unit risk. As discussed in the previous section, there are two opposing views in this regard. The *specialization hypothesis* implies increasing profits per unit risk attributable to small business lending. The benefits of specialization include management expertise, high quality monitoring of borrowers, and minimization of diseconomies of scope that raises operating costs. On the other hand, the *diversification hypothesis* implies decreasing profits per unit risk from specialization. Modern portfolio theory would predict that a diversified loan portfolio reaps the benefit of reduced risk and, holding profit constant, offers a higher profit per unit risk. Which of these two hypotheses is supported in the case of small business lending? In this section we describe empirical tests that seek to answer this question.

Small business lending is defined here as all commercial loans under \$250,000. Because there is a strong correlation between business size and loan size, we believe that loans under \$250,000 are most representative of small business loans (i.e., loans under \$1,000,000 would no doubt contain many loans made to large firms, and loans under \$100,000 would not capture larger loans to small business firms).

A. Profit Analyses

Following previous studies, univariate and multivariate profit analyses are performed on the relationship between small business lending and profit variables. Table I defines the dependent and independent variables. Also, figures are domestic to exclude U.S. bank activities in foreign countries. Updating prior studies, quarterly data are collected from the Call Reports of Income and Condition for all insured U.S. commercial banks for the period 1994-2001. It should be noted that only the mid-year report contains data on the outstanding small business loans held by banks.

We define small business lending activity as the ratio of small commercial and industrial and commercial real estate loans less than \$250,000 to total assets (SMALLBUS). Generally speaking, it is reasonable to believe that individual small business loans are riskier than loans to larger firms. Smaller firms are less well diversified, have less access to capital and liquidity, and have more limited management resources than larger firms. Given the higher risk faced by small business lenders, we expect this variable to be positively associated with ROA profit measures.

The diversification (DIVERS) measure is the HHI of the loan portfolio (i.e., the sum of squared ratios of a loan category/total loans for business loans, real estate loans, consumer loans, and agricultural loans). As such, lower DIVERS implies higher diversification. Hence, if a bank's diversification across loan categories increases profitability, this variable will have a negative coefficient sign.

The risk measures in the present study reflect different dimensions of the on- and off-balance sheet risk of banks. All the measures will be calculated per dollar of total assets. Loan and lease losses net of recoveries to total assets (LOSS) is the most often cited indicator of bank risk. Since most banks obtain most of their earnings from the loan portfolio, controlling *credit risk* is critical to survival and profitability.

Total equity capital to total assets (EQUITY), referred to as a measure of overall leverage by regulators, represents the ownership stake of shareholders in the bank. As mentioned above, equity is a key risk measure because it serves as a cushion to absorb unexpected losses. If bank equity falls close to zero, federal regulators can close the institution. Clearly, higher equity ratios reduce perceived bank *capital risk*.

Over the last decade, the ratio of off-balance sheet activities to total assets (OFFBAL) has dramatically increased in the banking industry, especially among multi-billion dollar banks. These off-balance sheet services (as well as others) enable banks to earn service revenue and enhance their relationships with clients. However, while they help reduce clients' risks, they increase the *off-balance sheet risk* exposure of the bank.

The next risk measure is inversely related to risk -- namely, the ratio of total securities to total assets (SECURITIES). By definition, increasing the securities ratio decreases the ratio of total loans to assets and thereby reduces bank *liquidity risk* (i.e., securities act as a secondary reserve for meeting liquidity needs of banks).

The extent to which banks use purchased funds as a proportion of total assets (PURCHASED) is another measure of risk. Deregulation of interest rates on deposits has increased the use of purchased funds by banks and, consequently, their ability to change their *funding risk*.

Two additional variables are included as control measures in the multivariate regression analyses -- namely, market structure (or market risk) and bank size. Market structure is proxied by the well-known Herfindahl index (HHI). Regarding the latter variable, HHI is the sum of squared ratios of the total assets of the *i*th bank to the aggregate total assets of all banks in the SMSA for urban areas or county for other areas. Bank size is simply measured by the log of total assets (SIZE).

We examine the relationship between ROA and small business lending in a fixed-effects panel regression model² generally stated as:

$$ROA_{it} = f(X_{it}, Y_{it}) + \Sigma_{it} \quad (1)$$

where ROA_{it} is the rate of return on assets (or net income after taxes to total assets), X_{itj} (Hwan, subscripts are different from equation) consists of small business lending and diversification variables, and Y_{itj} (Hwan, subscripts are different from equation) represents risk and other control variables. Previous studies employed cross-sectional regression methods to test the relationship between small business lending and bank profitability in a particular year. By contrast, we run fixed-effects regression models using pooled annual data for the years 1994 to 2001. The advantage of this approach is that, by transforming the data into deviations from firm-specific means and leaving only (Hwan, not sure of wording "leaving only" here -- is there a better way to say this? -- perhaps Himmelberg et al. say some words on this point -- just use the same words they use) the time-series variation in the data, the regression model controls for unmeasured firm characteristics that influence the performance measurement of banks (i.e., assumed constant over time via the firm-specific intercept term).

² See Himmelberg, Hubbard, and Palia (1999) for discussion on the advantages of the fixed effects model (i.e., in the present case we seek to control for unmeasured bank characteristics that can influence their profitability).

B. Efficient Frontier Analyses

Next, we extend previous studies of specialized lenders in banking by employing modern portfolio analysis methods to assess the riskiness and profitability of banks specializing in small business lending to other banks specializing in large business, real estate, agriculture, and consumer loans. The bottom of Table I gives the definitions of these loan specializations.

A mean-variance optimization procedure is used to estimate the efficient frontier for bank loan portfolios. Rather than using banks' stock rates of return, due to the lack of stock price data for most banks (with the exception of multi-billion dollar banks), we use quarterly rates of return on equity (ROE) from balance sheet and income statement data for various specialized lenders in the period 1994-2001. Specialized lenders are banks in the top decile among all insured U.S. banks in a particular lending area, including small business, large business, real estate, consumer, and agricultural loans (see Table I). In larger bank asset size groups we relaxed this constraint to include banks in deciles six to nine in order to gather sufficient observations for a particular type of specialized lender (as discussed in the empirical results section). Additionally, a group of diversified banks with a balanced loan portfolio was added to the analyses. These banks were in deciles four to six in all loan areas for a given year. While they are diversified in terms of their loan portfolio, it is possible that they are less diversified overall than a particular type of specialized lender, who could take advantage of geographic diversification or diversification within a loan category to reduce risk. The balanced lender group enables us to determine if the source of diversification benefits to specialized lenders is attributable to loan diversification versus geographic or other means of diversification. Finally, a random sample (n = 75) of banks for each size group is selected. Like the balanced lenders, this bank group is a control group against which to compare other specialized lenders.

Earlier work by Blair and Heggstad (1978) developed a portfolio theory of bank investment. They assumed that banks purchase a portfolio of assets with known (subjective) probability distributions, seek to maximize the expected utility of uncertain profits, are risk-averse, do not have riskless assets available due to interest rate risk, and fail when losses on assets exceed capital. From Chebychev's theorem, the probability of uncertain asset earnings (X) for a bank falling below its capital (C) is at most equal to the probability of X being less than k standard deviations from E(X). More specifically,

$$\Pr\{X < [E(X) - k \sigma]\} \leq 1/k^2. \tag{2}$$

Re-writing equation (2) in terms of the rate of return on equity capital [see Koehn and Santomero (1980)],

$$\Pr\{X/C < [E(X)/C - k \sigma/C]\} \leq 1/k^2. \tag{3}$$

Since at bankruptcy $-X = -C$ (or $(C - X = 0$ net worth), $-C = E(X) - k \sigma$. Dividing by C and solving for k, $k = [E(X)/C + 1]/(\sigma/C)$. Substituting k into equation (3),

$$\Pr[E(X)/C < -1] \leq (\sigma/C)^2/[E(X)/C + 1]^2, \tag{4}$$

which implies that the probability of bankruptcy is higher per unit of capital the lower the level of expected asset earnings and the larger the variability of such earnings [see also Haubrich (1998)].

Figure 1 illustrates the efficient frontier of risky assets available to the small banks. The point D represents a diversified bank, whereas points SBL, LBL, RE, AG, and CS represent banks specializing in small business loans, large business loans, real estate loans, agricultural loans, and consumer loans, respectively. The efficient frontier is based on optimal weighted average combinations of the specialized banks. Samples of diversified banks (i.e., balanced bank and random sample bank groups) will be added to the analyses to examine their location in risk and return space. The slope of lines A and B equals the square root of the reciprocal of the probability of bank failure in equation (4). The lower the slope of this line, the higher the probability of bank failure would be. At least in theory, specialized banks should have lower slopes than diversified banks, as depicted in Figure 1. However, empirical evidence is needed to determine if this theoretical relationship holds in practice. As discussed in the previous section, some evidence exists in the empirical literature for specialized lenders earning higher returns per unit risk than diversified lenders in the banking industry.

To our knowledge, no other studies have pursued the above analyses with mean-variance optimization methods that solve for the efficient frontier. Hughes, Lang, Mester, and Moon (1996) take a theoretical approach similar to Figure 1, but rather than estimating the efficient frontier, they estimate a best-practice, risk-return frontier for bank equity via maximum-likelihood regression techniques. Subsequently, they compare the expected equity return, efficiency, and safety of banking organizations by regressing these measures on different variables that proxy geographic diversification. We propose to compute the efficient frontier for banks in different size groups and then evaluate the diversification of each specialized lender by comparing their probability of failure to that obtained for a hypothetical bank with equal expected rate of return. To do this we simply compare the specialized lender in risk-return space to a bank located on the efficient frontier with equal expected rate of return on equity. According to modern portfolio theory, diversification does not affect profit rates; instead, it reduces the risk per unit profit of a lender (or investor). Our portfolio analyses enable comparisons between different types of specialized and diversified lenders. In this way we can assess the extent to which small business lenders are diversified relative to other specialized lenders. Data inputs for the computation of the efficient frontiers for the five bank asset size groups are the mean quarterly rates of return on equity from 1994 to 2001 ($n = 32$) for each of seven categories of lenders (i.e., small business, large business, real estate, consumer, agricultural, diversified lenders, and a random sample of banks).

III. Empirical Results

A. ROA Profit Analyses

Univariate Results. Tables II and III report the univariate tests of small business lending and ROA, respectively. Results are broken down by the decile grouping of banks in terms of small business lending (i.e., banks in decile 10 make the most small business loans as a proportion of total assets in the banking industry). Variables are averaged over the sample period 1994-2001.

Table II gives the mean small business lending for each decile and bank size group. It is interesting to observe that banks in the highest decile devoted about 20 percent of their total assets to small business lending. This result was true for all bank size groups. Other

percentage holdings of small business loans for each decile are similar across bank size groups. Thus, we infer that, contrary to the common argument that small businesses are forced to rely on small banks for their credit needs, large banks play an important role in the provision of credit to the small business sector.

Casual inspection of Table III suggests that, within the same size category, average bank rates of return on assets (ROA) decline as small business lending increases.³ T-tests for mean differences between decile groupings of banks within the same size category demonstrate that this relationship is highly significant (at the one percent level) in most cases across the five bank size groups and for all banks. Because these tests do not control for differences in other variables, especially bank risk, no definitive inferences about how small business lending affects bank profitability can be made at this point.

Multivariate Results. Table IV reports the fixed-effects panel regression findings for the years 1994 to 2001 using ROA as the dependent variable. In Table IV alternative models labeled 1-4 were run to comprehensively test small business lending and diversification effects on bank profitability. Model 1 is a simple model. Model 2 incorporates a size dummy (SIZEDUM) to control for differences in size calculated by deflating total assets to 1994 dollars using the urban Consumer Price Index (CPI-U).⁴ Model 3 includes interaction variables between the size dummy variables and the SMALLBUS variable to allow the effect of exposure to small business loans to vary by size group. Model 4 contains interaction variables between the size dummy variables and the DIVERS variable to test how asset diversification of banks affects their profitability in each size group.

The results reported in Table IV generally support the *specialization hypothesis*. The variable SMALLBUS is in all models positive and normally statistically significant. Also, the DIVERS variable is also consistently positive and significant, which means that less diversified banks tended to have higher profitability. Model (1) reveals that, after controlling for risk and other factors, ROA decreases as bank size increases (i.e., a negative and significant SIZE coefficient at the 0.01 level). Model (2) shows that the smallest size group, which is the default group, performs the best in generating profits per unit of assets (ROA). The difference in earning magnitudes is especially significant between the default group and the second smallest group. Model (3) provides results for the interaction between the size dummy variables and the SMALLBUS variable. As shown there, small business exposure tends to have either neutral or positive effects on bank ROA. Smaller banks have a significant interaction coefficient for the interaction between SIZEDUM1 and SMALLBUS at the 0.01 level. Finally, results for model (4) indicate that diversification has mixed effects on bank ROA across the bank size categories. Diversification tends to lower ROA among small banks (i.e., positive and significant interaction coefficient for SIZEDUM1 and DIVERS), but it is associated with higher ROA among larger banks (i.e., negative and significant SIZEDUM3 and DIVERS coefficient). Thus, it appears that diversification benefits increase as bank size increases.

³ We also document similar univariate tests for the ROE. The results of ROE confirm the ROA findings – that is, especially for very small banks, small business lending tends to lower bank profitability. The ROE results are available upon request from the authors.

⁴ The size dummy variables are created by dividing the sample into by five different assets size: (1) less than \$100 million (very small), (2) \$100-\$300 million (small), (3) \$300-\$500 million (medium), (4) \$500 million-\$3 billion (large), and (5) greater than \$3 billion (very large). The dummy variable is coded so that the smallest group of banks is the control group (i.e., a value of 0).

Other variables with significant estimated coefficients indicate that banks with higher ROA profitability tended to have lower equity capital, more off-balance sheet activities, and lower purchased funds. Another result worth mentioning is significantly higher profits associated with increased exposure to securities investment. The conventional wisdom is that higher investments in securities can diminish the profitability of a bank due to opportunity cost of funds held in lower-yield investments. Also, the weak positive association between profit and the concentration index (HHI) suggests that higher banking market concentration tended to increase bank profitability, which could be explained by possibly lower competition in markets dominated by a relatively few large banks. Overall, we infer that specializing in small business lending positively affected banks' ROA across bank size groups, especially within the smallest bank size group. Relatedly, diversification tended to negatively affect bank profits, with the exception of larger banks.

Robustness Test for Multivariate Results. As a robustness test, we re-ran the multivariate regression analyses using: (1) a balanced sample that requires data for each bank is available for all sample years 1994-2001, and (2) the Hurber/White sandwich estimator of variance which adjusts for heteroskedasticity. Available upon request from the authors, the results are virtually the same as in Table IV for the unbalanced sample.

B. ROE Efficient Frontier Analyses

Here we report the results for efficient frontiers computed from quarterly rates of return on equity (ROE). Seven categories of lenders are employed: (1) agricultural lenders, (2) balanced (or diversified) lenders, (3) large business lenders (greater than \$250,000 loan concentrations), (4) consumer lenders, (5) real estate lenders, (6) small business lenders (less than \$250,000 loan concentrations), and (7) random sample (or diversified) lenders ($n = 75$ banks for a particular size group). Efficient frontiers are computed for each size group. Comparison of the location of each type of lender under the efficient frontier yields the risk and return characteristics of small business oriented lenders compared those of other specialized and diversified lenders. To conserve space efficient frontiers for only the smallest and largest size groups are reported. However, detailed results on expected equity returns and the probability of failure for each lender category derived from efficient frontier analyses are reported Table V.

Figure 2 graphically illustrates the efficient frontier for very small banks with less than \$100 million in total assets. The location of each type of lender is shown relative to the efficient frontier. Assuming an intercept of -1 , a ray from the intercept to each of the six categories of specialized lenders can be visualized. As mentioned before, the slope of this ray can be used to compute the probability of bankruptcy for a particular type of specialized lender.

Table V contains the probability of failure results for each of the five bank size groups. The "lender type" columns give the results for a line drawn through the lender point B in Figure 1, while "efficient frontier" columns report the results for a line connecting a hypothetical bank with the same expected ROE but which is fully diversified and lies on the efficient frontier at point A in Figure 1. Two probabilities of failure are shown for each type of lender. The difference between these two probabilities of failure represents the increase in failure risk due to being a particular type of lender relative to the efficient frontier, holding expected return constant.

Among very small banks, as discussed above with respect to Figure 2, small business lenders had the lowest probability of failure compared to the five other types of lenders. Table

V shows that the probability of failure among these banks was only 0.050 percent, or a failure rate of about five banks out of 10,000 (i.e., there were between 8,000 and 11,000 banks in our sample period). They also had the lowest average quarterly ROE. Hence, small business lenders had lower equity risk and return compared to other types of lenders. Also, they are close to the efficient frontier, as the decrease in probability of failure due to lying on the efficient frontier is only 0.0036. These results indicate that very small banks specializing in small business loans are relatively well diversified.

The highest risk and return lenders among very small banks were consumer-oriented banks. These banks had failure rates of about 10 banks out of 10,000, which is almost twice the failure risk of small business lenders. Consumer banks lie on the efficient frontier and represent the right most point of the frontier. This means that they have the highest expected return among portfolios on the efficient frontier. Other types of lenders had failure rates between those for small business lenders and consumer lenders and were less well diversified in terms of larger differences in failure probabilities relative to fully diversified banks on the efficient frontier. Notice that balanced and random sample lenders were not necessarily more fully diversified than other specialized lenders. As such, we infer that the major source of diversification benefits is not lending across different types of loans per se; instead, geographic, economic sector, and perhaps idiosyncratic differences among borrowers are more important sources of loan portfolio diversification.

Figure 3 shows that efficient frontier results for very large banks. Here again we find that small business lenders (consumer lenders) are the lowest (highest) risk and return loan portfolios. Those banks with higher proportions of small business lending had the lowest probability of failure (i.e., about 0.1453). Notice also that large business lenders had low risk and return similar to small business lenders. By contrast, balanced lenders were relatively far from the efficient frontier, which means that they were less well diversified than the other lender groups (with the exception of real estate lenders).

Summarizing other findings in Table V:

- Among small banks in size group 2, real estate and large business lenders are the highest risk in terms of failure probability among different types of lenders but now consumer lenders are the lowest risk, with failure rates of about 10 banks out of 10,000. Notice also that agricultural, balanced, and random sample lenders had low expected failure rates similar to consumer lenders.
- Among medium-sized banks in size group 3, large business lenders are lowest in risk and consumer lenders are again the highest risk. Small business lenders appear to have average risk among different kinds of small and medium sized banks.
- Compared to other bank size groups, very large multi-billion dollar banks in size group 5 tended to have the highest lender type probabilities of failure in the range of 14 to 22 banks per 10,000 banks. This range is higher than the riskiest very small or small bank lender categories with assets under \$300 million. We infer that small banks are fairly well diversified relative to large banks.

The latter finding contradicts the popular notion that large banks are more diversified and lower risk than small banks. It is likely that small banks obtain substantial diversification benefits by providing loans to a variety of types of small business firms and other small borrowers. Simply increasing the size of individual loans does not necessarily offer diversification benefits to large banks.

In sum, for small and large banks, efficient frontier analyses of ROE demonstrate that small business lending boosts bank profitability per unit risk relative to other loan portfolio compositions primarily by means of reducing failure risk. Importantly, small business lenders are well-diversified institutions, which explains their low failure risk. These results are consistent with earlier ROA profit findings based on panel regression analyses.

IV. Conclusions

This paper has examined the question of how small business lending affects bank profitability. Two opposing views in terms of the theoretical effects of specialized lending on bank profitability are tested. The *specialization hypothesis* argues that banks focusing their loan activities in a particular area take advantage of management expertise, quality loan monitoring, and lower diseconomies of scope that lower operating costs. This hypothesis would predict higher profitability among banks specializing in small business loans. Alternatively, the *diversification hypothesis* is grounded in modern portfolio theory, which implies that holding a variety of different types of loans will reduce risk and, holding profit constant, increase profits per unit risk. This hypothesis would predict that banks specializing in small business loans forego the risk-reducing benefits of diversification and, therefore, have lower profitability.

Our empirical analyses were divided into two parts: (1) multivariate panel regression tests of how small business lending affects banks' rate of return on assets (ROA), and (2) efficient frontier analyses of how small business lending affects banks' rate of return on equity (ROE) and associated failure risk. The panel regression results indicated that small business lending had either little (or no) effect or a positive effect on ROA across different bank size groups. Relatedly, diversification in a variety of loan categories tended to negatively affect bank profits, with the exception of larger banks. The efficient frontier analyses revealed that small business lending is associated with higher ROEs per unit risk due to lowering of bank failure risk. Thus, we conclude that the evidence supports the specialization hypothesis, rather than the diversification hypothesis. Small business lenders reap benefits from specialization, particularly in terms of reducing failure risk. Our results provide empirical evidence in favor of Winton's argument that overly-diversified lenders may well have higher risk than specialized lenders. The results further showed that, compared to a well-diversified portfolio, other specialized lenders are also better positioned in risk-return profile.

We conclude that small business lending normally does not have a negative effect on bank profitability – either neutral or positive effects are the norm. Interestingly, while it is commonly believed that small business lending is risky, we find it tends to reduce bank failure risk for many banks regardless of their asset size. If larger, more diversified organizations are the future of the banking industry, small business lending can play a positive role in terms of contributing to bank profitability and failure risk reduction. Consequently, despite the on-going consolidation movement in the U.S. banking industry, banks likely will continue to play a central role in the provision of small business credit.

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Table I
Definitions of variables

Profitability:	
ROA	Rate of return on assets, or net income after taxes to total assets
ROE	Rate of return on equity, or net income after taxes to total equity
Focus:	
SMALLBUS	Small business loans (commercial and industrial loans and commercial real estate loans under \$250,000) to total assets
Diversification:	
DIVERS	A diversification measure using HHI (i.e., the sum of squared ratios of a loan category/total loans for business loans, real estate loans, consumer loans, and agricultural loans).
Risk and other control variables:	
LOSS	Loan and lease charge-offs minus recoveries to total assets
EQUITY	Tier 1 (core) capital, or total equity to total assets
OFFBAL	Total off-balance sheet activities to total assets
SECURITIES	Total securities to total assets
PURCHASED	Purchased funds, or large time deposits plus other borrowed money, to total assets
HHI	Herfindahl index for the county or SMSA in which bank is located
SIZE	Log of total assets deflated to 1994 dollars using the urban Consumer Price Index (CPI-U)
Other lending specialization definitions:	
LARGEBUS	Large business loans (commercial and industrial loans and commercial real estate loans more than \$250,000) to total assets
REALESTATE	Total real estate loans excluding small business real estate loans under \$250,000 to total assets
CONSUMER	Total consumer loans to total assets
AGLOAN	Total agricultural loans to total assets

Table II

Average small business loans/total assets (SMALLBUS) for U.S. commercial banks in the period June 1994-June 2001: Means and t-tests for decile rankings by small business lending activity and bank asset size groups (in percent)

Decile	<\$100		\$100-\$300		Assets in Millions \$300-\$500		\$500-\$3000		>\$3000		All Banks	
	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
1	0.00	6,632	0.00	447	0.00	23	0.00	38	0.00	8	0.00	7,148
2-3	0.00	12,228	0.00	1,759	0.00	105	0.00	151	0.00	54	0.00	14,297
4-7	4.03	12,825	5.39	8,644	5.83	2,295	5.04	3,442	2.88	1,387	4.65	28,593
8-9	12.37	6,857	12.16	5,806	11.87	1,029	11.58	580	11.41	25	12.21	14,297
10	21.05	4,848	19.52	2,053	19.35	162	20.13	82	20.81	4	20.55	7,149
All	5.50	43,390	8.40	18,709	7.95	3,614	5.99	4,293	2.95	1,478	6.36	71,484

t-Tests for Mean Differences^{ab}

Decile Comparisons	Assets in Millions						All Banks
	<\$100	\$100-\$300	\$300-\$500	\$500-\$3000	>\$3000		
1 vs. 10	-292.18***	-230.57***	-44.47***	-19.77***	na	-358.92***	
2 and 3 vs. 8 and 9	-573.49***	-528.10***	-224.59***	-172.79***	-31.66***	-824.66***	
1, 2, 3 vs. 8, 9, 10	-312.57***	-306.56***	-122.38***	-71.57***	-16.61***	-435.94***	

^aNot available (na) due to small sample sizes.

^bAsterisks indicate the level of significance: *--.10, **--.05, and ***--.01.

Table III

Average rates of return on assets (ROA) for U.S. commercial banks in the period June 1994-June 2001: Means and t-tests for decile rankings by small business lending activity and bank asset size groups (in percent)

Decile	<u>Assets in Millions</u>											
	<\$100		\$100-\$300		\$300-\$500		\$500-\$3000		>\$3000		All Banks	
	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
1	0.61	6,632	0.75	447	1.02	23	0.91	38	1.95	8	0.63	7,148
2-3	0.66	12,228	0.71	1,759	1.07	105	1.29	151	0.84	54	0.68	14,297
4-7	0.61	12,825	0.59	8,644	0.66	2,295	0.64	3,442	0.68	1,387	0.62	28,593
8-9	0.43	6,857	0.60	5,806	0.62	1,029	0.61	580	0.69	25	0.52	14,297
10	0.43	4,848	0.59	2,053	0.23	162	0.68	82	0.69	4	0.48	7,149
All	0.58	43,390	0.61	18,709	0.66	3,614	0.66	4,293	0.70	1,478	0.60	71,484

t-Tests for Mean Differences^{ab}

Decile Comparisons	<u>Assets in Millions</u>					
	<\$100	\$100-\$300	\$300-\$500	\$500-\$3000	>\$3000	All Banks
1 vs. 10	10.37***	2.55**	1.41	1.96*	na	9.12***
2 and 3 vs. 8 and 9	11.46***	6.78***	3.58***	2.83***	1.03	9.42***
1, 2, 3 vs. 8, 9, 10	14.82***	6.66***	3.85***	3.08***	2.02**	12.43***

^aNot available (na) due to small sample sizes.

^bAsterisks indicate the level of significance: *--.10, **--.05, and ***--.01.

Table IV

Fixed-effects panel regression model results for U.S. commercial bank profits (ROA) and small business lending in the period 1994-2001 (t statistics in parentheses^a)

Independent variables	Alternative Models			
	Model 1	Model 2	Model 3	Model 4
LOSS	-0.0679 (-1.24)	-0.0753 (-1.38)	-0.0733 (-1.34)	-0.0727 (-1.33)
EQUITY	-0.0223 (-3.99)***	-0.0131 (-2.38)**	-0.0133 (-2.40)**	-0.0134 (-2.40)**
OFFBAL	.00004 (9.05)***	.00004 (9.02)***	.00004 (8.97)***	.00004 (9.00)***
SECURITIES	.0046 (1.71)*	.0059 (2.17)**	.0061 (2.23)**	.0066 (2.28)**
PURCHASED	-0.0068 (-1.63)	-0.0162 (-3.95)***	-0.0157 (-3.81)***	-0.0166 (-4.04)***
SMALLBUS	.0080 (1.90)*	.0074 (1.76)*	.0025 (0.55)	.0076 (1.82)*
HHI	.0035 (1.75)*	.0017 (0.83)	.0016 (0.83)	.0015 (0.77)
LNTA	-0.0056 (-8.47)***			
DIVERS	.0106 (2.88)***	.0069 (1.89)*	.0072 (1.97)**	.0079 (1.66)*
SIZEDUM1		-0.0026 (-3.05)***	-0.0054 (-4.37)***	-0.0048 (-3.39)***
SIZEDUM2		-0.0024 (-1.47)	-0.0040 (-1.52)	-0.0015 (-0.60)
SIZEDUM3		-0.0025 (-1.19)	-0.0037 (-1.36)	.0021 (0.74)
SIZEDUM4		-0.0024 (-0.62)	-0.0046 (-0.90)	.0010 (0.22)
SIZEDUM1 * SMALLBUS			.0289 (3.13)***	
SIZEDUM2 * SMALLBUS			.0169 (0.66)	
SIZEDUM3 * SMALLBUS			.0126 (0.49)	
SIZEDUM4 * SMALLBUS			.0423 (0.42)	
SIZEDUM1 * DIVERS				.0106 (1.85)*
SIZEDUM2 * DIVERS				-0.0035 (-0.41)
SIZEDUM3 * DIVERS				-0.0182 (-2.18)**
SIZEDUM4 * DIVERS				-0.0106 (-1.12)
Number of panels	11,788	11,788	11,788	11,788
F-statistics	20.13***	9.89***	8.03***	8.21***
Adjusted R ²	0.1950	0.1941	0.1943	0.1943

^aAsterisks indicate significance at the following levels: *-- .10, **-- .05, and ***-- .01.

Table V

Expected equity return and bank failure risk by lending type and bank size group^a

Lender Type (Size Groups 1-5)	Expected Equity Return	Lender Type Standard Deviation	Lender Type Probability of Failure	Efficient Frontier Standard Deviation	Efficient Frontier Probability of Failure	Difference in Probability of Failure
Agricultural Lenders (1)	0.0690	0.0287	0.0721	0.0271	0.0642	0.0079
Balanced Lenders (1)	0.0651	0.0296	0.0772	0.0252	0.0559	0.0213
Large Business Lenders (1)	0.0587	0.0286	0.0729	0.0231	0.0476	0.0253
Consumer Lenders (1)	0.0702	0.0333	0.0968	0.0333	0.0968	0
Real Estate Lenders (1)	0.0654	0.0305	0.0819	0.0253	0.0563	0.0256
Small Business Lenders (1)	0.0519	0.0236	0.0503	0.0228	0.0467	0.0036
Random Sample (1)	0.0585	0.0260	0.0603	0.0230	0.0472	0.0131
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Agricultural Lenders (2)	0.0822	0.0349	0.1040	0.0348	0.1034	0.0006
Balanced Lenders (2)	0.0787	0.0346	0.1029	0.0320	0.0880	0.0149
Large Business Lenders (2)	0.0626	0.0377	0.1259	0.0296	0.0762	0.0497
Consumer Lenders (2)	0.0792	0.0345	0.1022	0.0322	0.0890	0.0132
Real Estate Lenders (2)	0.0815	0.0392	0.1314	0.0336	0.0965	0.0349
Small Business Lenders (2)	0.0817	0.0362	0.1120	0.0337	0.0971	0.0149
Random Sample (2)	0.0783	0.0353	0.1071	0.0318	0.0870	0.1546
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Agricultural Lenders (3)	0.0879	0.0388	0.1272	0.0380	0.1220	0.0052
Balanced Lenders (3)	0.0825	0.0365	0.1137	0.0348	0.1033	0.0104
Large Business Lenders (3)	0.0828	0.0348	0.1033	0.0348	0.1033	0
Consumer Lenders (3)	0.0933	0.0462	0.1786	0.0462	0.1786	0
Real Estate Lenders (3)	0.0885	0.0391	0.1290	0.0385	0.1251	0.0039
Small Business Lenders (3)	0.0880	0.0382	0.1233	0.0381	0.1226	0.0007
Random Sample (3)	0.0874	0.0405	0.1387	0.0376	0.1196	0.0191
<hr/>						
Agricultural Lenders (4)	0.0927	0.0414	0.1435	0.0403	0.1360	0.0075
Balanced Lender (4)	0.0876	0.0377	0.1202	0.0376	0.1195	0.0007
Large Business Lenders (4)	0.0881	0.0385	0.1252	0.0378	0.1207	0.0045
Consumer Lenders (4)	0.0962	0.0430	0.1539	0.0430	0.1539	0
Real Estate Lenders (4)	0.0924	0.0403	0.1361	0.0402	0.1354	0.0007
Small Business Lenders (4)	0.0861	0.0370	0.1161	0.0370	0.1161	0
Random Sample (4)	0.0861	0.0370	0.1161	0.0399	0.1335	-0.0174
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Agricultural Lenders (5)	0.1016	0.0461	0.1751	0.0447	0.1647	0.0104
Balanced Lenders (5)	0.1017	0.0478	0.1882	0.0448	0.1654	0.0228
Large Business Lenders (5)	0.0941	0.0417	0.1453	0.0415	0.1439	0.0014
Consumer Lenders (5)	0.1169	0.0520	0.2168	0.0520	0.2168	0
Real Estate Lenders (5)	0.0976	0.0472	0.1849	0.0430	0.1535	0.0314
Small Business Lenders (5)	0.0938	0.0417	0.1453	0.0415	0.1439	0.0014
Random Sample (5)	0.1006	0.0454	0.1702	0.0443	0.1620	0.0082

^aBank size groups are defined as follows: (1) less than \$100 million (very small), (2) \$100-\$300 million (small), (3) \$300-\$500 million (medium), (4) \$500 million - \$3 billion (large), and (5) greater than \$3 billion (very large).

Figure 1
Portfolio analysis, loan specialization, and the probability of bankruptcy

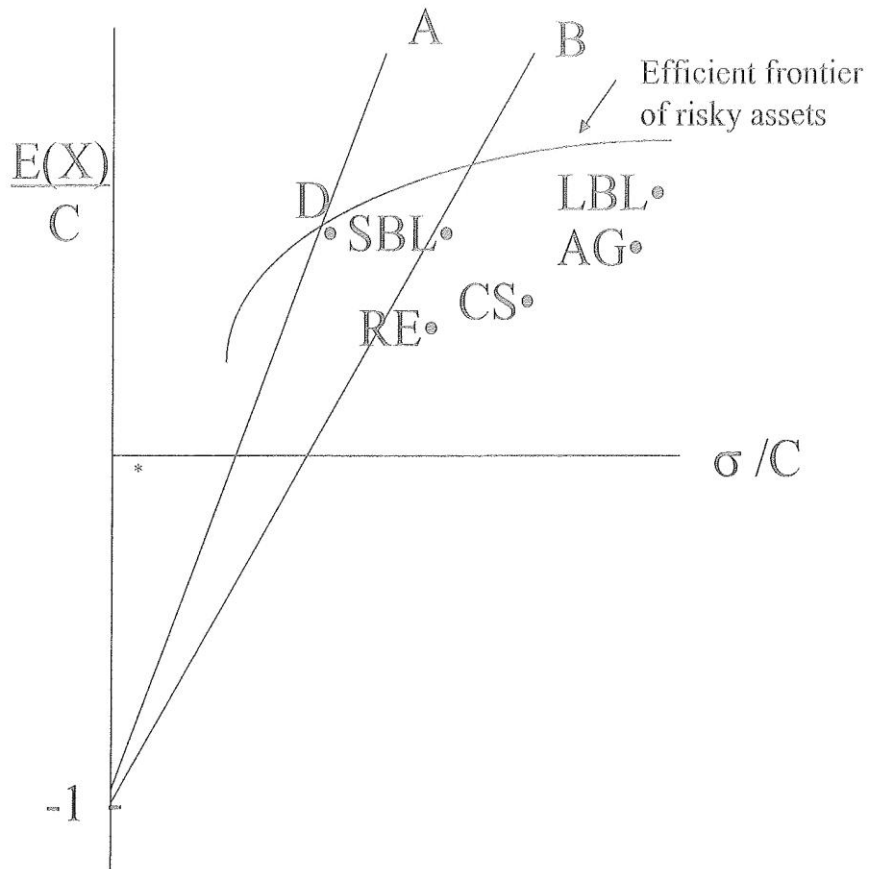


Figure 2

Efficient frontier of return on equity (ROE) for very small banks with less than \$100 million in total assets (quarterly data 1994-2001)

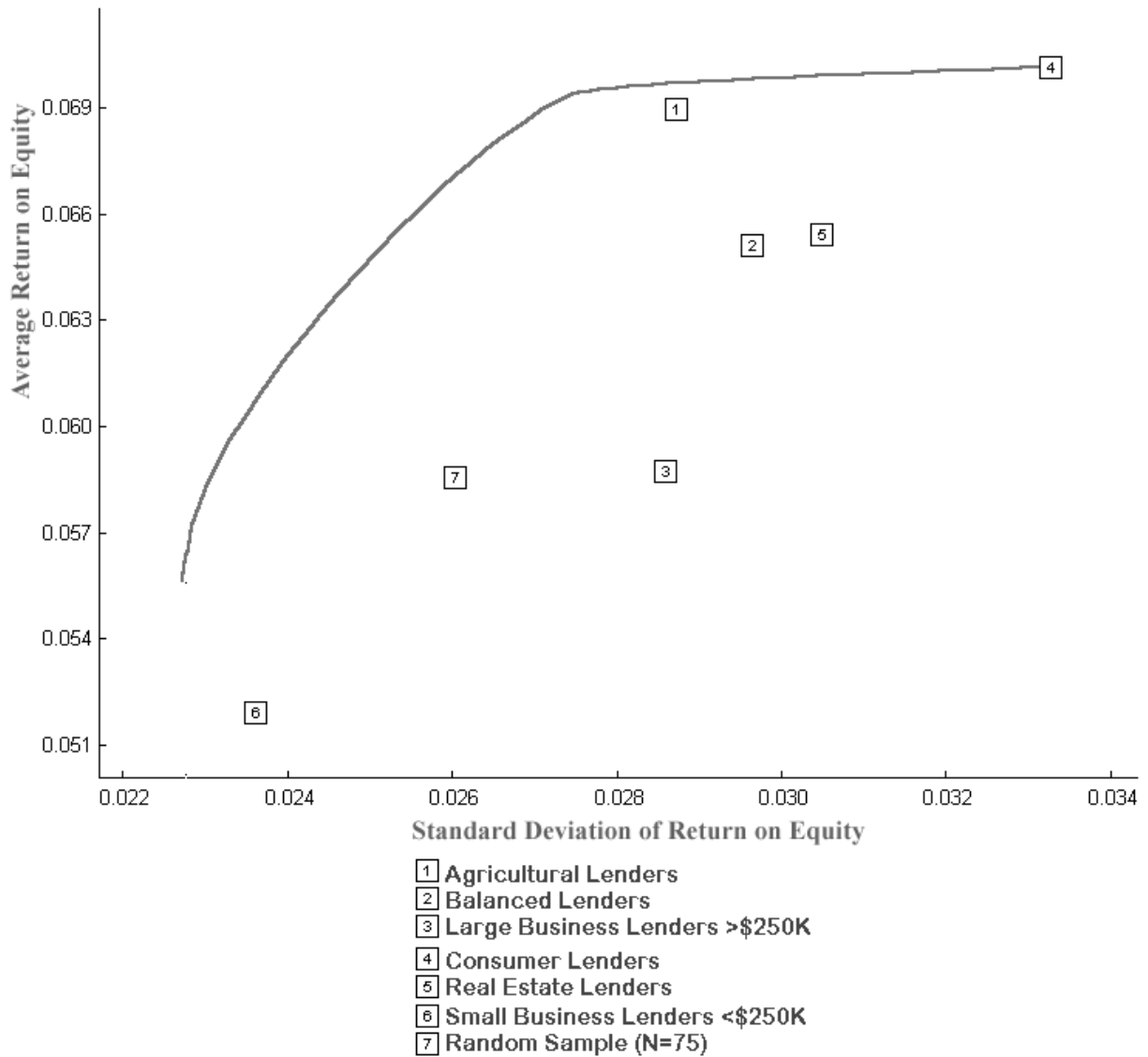


Figure 3

Efficient frontier of return on equity (ROE) for very large banks more than \$3 billion in total assets (quarterly data 1994-2001)

